occasionally tell in the right direction. Had Father Gerard not sacrificed his position by aiming so much at smart writing—had he favoured us with more solid thought instead of endeavouring "to split the ears of the groundlings"—his lucubrations would have received more respectful attention. But satire and cynicism, interspersed with ridicule, are not the best methods for securing consideration from men of science, and it is surprising that the author should have resorted so largely to their use.

R. MELDOLA.

THE LAWS OF FORCE AND MOTION.

The Laws of Force and Motion. By John Harris (Kuklos). (London: Wertheimer, Lea, and Co., 1890.)

IN his preface the author, very rightly, sounds a warning note against the arrogance of Conventional Science, in its tendency to become ultra-conservative, intolerant, and extremely dogmatic.

But Real Science will always welcome and encourage attack and contradiction, feeling sure that Truth will ultimately prevail in the consensus of the majority who have devoted themselves dispassionately to the consideration of the facts in dispute. "Transibunt multi et augebit Scientia."

We presume the author would not ask to be judged with more leniency than he has displayed for the opponents he has singled out; so we may say at once that, after careful winnowing, we have not secured those grains of fact and truth which we were led to expect.

The experimental apparatus described seems carefully constructed and suitable for exact measurements; but does not differ essentially from that employed by Smeaton more than 100 years ago. However, the author assumes the true scientific sceptical spirit, in refusing to accept implicitly the statement of theoretical laws without putting them to the test of practical experimental verification.

Mathematicians will understand the nature of the author's attacks on Conventional Science from the specimen on p. 31:—

> "It would seem that, some time ago, a highly influential party of natural philosophers (Leibnitz, the two Bernoullis, &c.) entertained and supported the idea that the momentum of a moving body varies as the square of the velocity. This idea or conclusion was probably based on an inference, that, since a double velocity of the resistance required four times the force to produce it, four times the momentum must have been imparted to the resistance."

After this wavering as to the meaning of momentum, we are quite prepared to find (p. 60) that the author is of the school who declare that the moon does not rotate.

The author cannot decide between 16·1 or 32·2 for the value of g (p. 24); and cannot settle in consequence whether the normal acceleration in a circle is the squared velocity divided by the radius or by the diameter (p. 19).

"Tangential force" is, in the author's opinion, a more correct scientific term to use than "centrifugal force," although he allows that the latter is hallowed by long usage; but in his treatment he enunciates a theorem on p. 21, "The actual lineal ratio of the sine to the arc, when the arc is an octant, is 9 to 10," quoted from his own "Treatise on the Circle and Straight Line"; this makes $\pi = 2\sqrt{2} \div 0{\cdot}9$, a result worth recording by collectors of mathematical curiosities.

We hoped to find something combative in the articles on the Tidal Effect of Lunar Gravitation (p. 57), and on the Moon's Gravitative Influence at the Equatorial Surface of the Earth measured by Pendulum Oscillations (p. 76), considering that even the great Abel went astray in his theory at this point; but our author confines himself to vague generalities.

He would perform a valuable service to Science if he employed his experimental skill in observing the effect of Lunar Gravity on the Seconds Pendulum, as Conventional Science asserts that this effect does not amount to more than a rate of one 200th of a second in the day, although so noticeable in the Tides.

"Some Propositions in Geometry," by the same author, is advertised at the end of the book, whereof the Trisection of the Angle, the Duplication of the Cube, and the Quadrature and Rectification of the Circle, occupy the chief part; but we wonder whether the author has quite settled in his Geometry that the versed sine (or vertical height) is proportional to the chord, in a circle (p. 71). This might have been a misprint, but that the author adds immediately a numerical illustration, by saying that, if the chord is duplicated, the versed sine is also duplicated.

And this homely mode of verifying a law of comparison, by halving or doubling some quantity, and then observing the consequent change in the phenomena, is the single idea we consider worth lifting from the book, for general purposes of convincing argument and illustration of a mathematical law.

A. G. G.

OUR BOOK SHELF.

An Introduction to the Mathematical Theory of Electricity and Magnetism. By W. T. A. Emtage, M.A. (Oxford: Clarendon Press, 1891.)

THE want of a text-book especially designed for the use of candidates for examinations in which a knowledge of the more elementary portions of the mathematical theory of electricity and magnetism is demanded has been felt for some time. Though the absence of such a book has caused some inconvenience, we are not at all sure that it has been detrimental to the study of electricity, for hitherto the candidate for a mathematical examination in electricity has been compelled to learn the subject from books such as those of Maxwell, or of Mascart and Joubert, in which electricity is treated as what it really is outside the examination-room—a subject in which mathematics and experiment are closely mixed and mutually helpful: it is to this that, we think, is to be ascribed a good deal of that interest which electricity, above all other subjects, seems to excite in its students. When, however, the analytical parts of the subject are divorced from the experimental, we do not believe they will be found to excite any special enthusiasm, or that the result will be much more interesting than an ordinary text-book for the Mathematical Tripos on, say, hydrostatics.

There is no doubt, however, that there is a demand for a text-book suitable for examination purposes, and this demand will, we think, be well met by the book before us. The scope of the work may be described by saying that it includes nearly all the analytical parts of Maxwell's larger treatise which do not involve analysis higher than the simpler parts of the differential and integral calculus;

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it thus covers the portions of electricity and magnetism which, under the new regulations, are selected for examination in Part I. of the Mathematical Tripos, and we have no doubt it will be found useful for that examination. The book is very well arranged, and the explanations are generally clear and concise. Among some minor points which, we think, might with advantage be altered in subsequent editions are the following. When discussing the rapidly alternating currents produced by discharging a Leyden jar, the author says: "We do not know, for instance, whether we are right in supposing the currents to be the same throughout the conducting wire." This seems an unnecessary affectation of ignorance, for we do know that such a supposition is certainly wrong. The method of determining "*v*" by repeatedly charging and discharging a condenser placed on one arm of a Wheatstone's bridge is not given, though several other less accurate methods are described. This is the more singular as the method itself is given in another part of the book as one for determining the capacity of a condenser, but no hint is given of its most important application. The method of measuring the self-induction of a coil, which is ascribed to Lord Rayleigh, is really due to Maxwell, and, though not in the treatise on "Electricity and Magnetism," is given in the paper on the "Dynamical Theory of the Electro-magnetic Field."

Le Sommeil et le Système Nerveux: Physiologie de la Veille et du Sommeil. Par S. Serguéyeff. (Paris: Felix Alcan, 1890.)

IT is difficult to understand why a writer upon the higher branches or outlying districts of neurology should assume that his readers are totally ignorant of the rudiments of that science, and should occupy nine-tenths of his book with a description of the anatomy and physiology of the nervous system. If, indeed, for the purpose of throwing new light upon his subject, he presented his facts in a new form, or taught them from a novel point of view, or arranged them so as to bring out some new principle, then there might be an excuse for restating the facts; but even then a brief summary would be enough for the purpose, there would be no need for the rediscussion of settled theories and the requotation of trite authorities. Scarcely ever do we find a writer on neurology who is content to assume that his readers are acquainted with the alphabet of his subject, or who will refrain from inflicting upon them the wearisome account of cells and fibres, of corona and cortex, illustrated by the familiar engravings that have done duty in so many previous books. The vicious habit is common enough and bad enough, but very rarely is it carried to such an extent as in the book before us, in which only about three hundred out of the seventeen hundred pages of which it is composed are devoted to the subject of which it is said to treat; the great bulk of the book being occupied by anatomical and physiological descriptions which are not in this case even relieved by illustration. So far is this system of padding carried, that the author has even inserted, in his book on waking and sleeping, descriptions of the minute structure of the retina, of the internal ear and the organ of Corti. When we have at last waded through his pages of preliminary matter, we do not find that he presents any fresh theory of sleep that is worth considering, or that he has any new facts to bring under our notice. It is a shame that a student should be trapped by an enticing title into spending his time in reading such stuff.

Elementary Science Lessons. By W. Hewitt, B.Sc. (London: Longmans, Green, and Co., 1891.)

THE thirty-six object-lessons contained in the present volume form the third part of a scheme of lessons drawn up by the author at the request of the Liverpool School Board. They are designed for children of Standard III., and are in continuation of others given in previously published volumes suitable for Standards I. and II. The author's long experience in teaching science to children in elementary schools gives him the ability which is necessary properly to draw up such a course as the one before us. For the most part the facts and principles dealt with relate to the classification of bodies into solids, liquids, and gases, and with the changes from one of these states to another. The experiments described may be performed with the simplest of apparatus, and the inferences to be drawn from them must be manifest to all children for whom the work is intended. Whenever possible, the principles considered in the lessons are applied to explain physiographical phenomena, thus aiding the development of that intelligent observation which is the soul of science. The arrangement of the matter is generally good, and elementary school teachers will find in the work exactly what they require for their pupils.

Solutions of the Examples in Charles Smith's "Elementary Algebra." By A. G. Cracknell. (London: Macmillan and Co., 1891.)

MR. SMITH'S small "Algebra" has deservedly obtained high favour in our schools for its lucidity. The work before us aims at presenting the solutions, not always necessarily in the shortest way, but rightly so as to "follow naturally from the formulæ and theorems with which the student is acquainted at that stage." It has Mr. Smith's *imprimatur*, for he has revised the sheets; and from our own examination of it we can commend it to teachers and students.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Anatomy of Heloderma.

THE number of NATURE for July 30, which I have only just seen, contains (p. 295) a criticism of a statement of mine, to which I have to answer. It is stated in my paper on the osteology of Heloderma that there are eight or nine premaxillary teeth in *H. horridum*, and only six in *H. suspectum*, because such is the number in the specimens examined by me. As Dr. Shufeldt has, on re-examination, found eight teeth in a specimen of the latter species, I admit that the distinction, as a specific character, does not hold good. It is just because my figures are *not* diagrammatic that they represent fewer teeth than are mentioned in the text; to anyone familiar with the dentition of lizards and snakes, it is clear enough that some of the teeth have been lost, and they were therefore not represented in the figures, which are faithful representations (in outline) of the objects from which they are drawn. I am much surprised at Dr. Shufeldt's statement, that he "cannot conceive of any lizard normally having but nine teeth in its premaxillary bone; it should at least be an even number." I could refer him to no end of examples of premaxillary teeth normally in odd number among lizards with single premaxillary; perhaps the best known is afforded by the family *Amphisbænidæ*. I must again correct Dr. Shufeldt on a matter of fact: my figure of *H. horridum* shows *seven* teeth, not *six*, as he states in his letter; and that of *H. suspectum five*, not *four*.

G. A. BOULENGER.

British Museum (Nat. Hist.), August 28.

A Straight Hand.

ALTHOUGH my writing master, who was an Englishman, taught me slanting letters which old habit still clings to, I approve highly what you say against it (NATURE, August 6, p. 325). Allow me to add some remarks on another side of that question. For many years past I have had in succession several amanuenses, and my first care has always been to require a straight hand without any distinction between up and down

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